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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/552,438

10/06/2005

Koichi Kanaya

125451

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11/01/2007

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ALEXANDRIA, VA 22320-4850

EXAMINER

CHEN, KEATH T

ART UNIT

PAPER NUMBER

1792

MAIL DATE

DELIVERY MODE

11/01/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/552,438

Applicant(s)

KANAYA ET AL.

Examiner

Keath T. Chen

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 26 September 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 6,8-10,12-14,16-18,20 and 21 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 6,8-10,12-14,16-18,20 and 21 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☐ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- ☐ Notice of Informal Patent Application
- ☐ Other: _____

DETAILED ACTION

Response to Amendment

Amendment on drawing filed on 07/09/2007 to comply with 37 CFR 1.84(p)(4) is accepted and objection to drawing has been withdrawn.

The claim amendment filed on 09/26/2007, addressing claims 6-21 rejection from the first office action (04/24/2007) and canceling claims 7, 11, 15 and 19. Amendment to claims 6, 8, and 9 are entered, and will be addressed below.

Response to Arguments

Applicant's arguments filed on 09/26/2007 have been fully considered and will be addressed below:

1. Regarding to 35 USC 102(b) rejection based on Moore '686 and 35 USC 102(e) rejection based on Anderson '145, of claims 6, 8, 10, 12, 14, 16, 18, and 20, see page 6 and 7, applicant's arguments that the rejections do not fit the amended claims. This argument is persuasive and 35 USC 102 rejections of claims 6, 8, 10, 12, 14, 16, 18, and 20 have been withdrawn. New ground of rejection necessitated by this amendment will be addressed below.
2. Regarding to 35 USC 112 second paragraph rejection on claims 8, 9 and their dependent claims 12, 13, 16, 17, 20, and 21, see page 6, applicant's arguments have been fully considered but they are not persuasive.

Applicant traversed the rejection without pointing out specific ground of traverse and amended grammatical errors in claims 8 and 9 without answering ground of the rejection on page 3 of first office action. This rejection remains in effect.

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3. Regarding to 35 USC 103 rejection of amended claim 6 and dependent claims 9, 11, 13, 15, 17, 19, and 21, see page 9 and 10, based on '686 in view of Somekh '366, applicant's argument have been fully considered but they are not persuasive.

Applicant acknowledge that '366's wafer holder with a surface sloping at a slight angle of 1-3° and practiced during processing.

Applicant traverse the rejection based on "one of ordinary skill in the art would not have been motivated ...to have a pocket for ...300 mm ... not more than 1° ..." without emphasis exactly which point is not taught in the prior arts.

For the motivation, the first office action points out "'686 also teaches that the particular dimensions the substrate surround ring are determined empirically to minimize slip and maintain substantially uniform temperature in substrate #2304 (col. 25, line 13-17)" on page 8.

The first office action also points out "'686 teaches the use of susceptor use in 300 mm diameter wafers " on page 8.

'366 teaches 1°, which is in applicant's claimed range. Overlapping ranges have been held to be a prima facie case of obviousness, see MPEP 2144.05.

4. Regarding to 35 USC 103 rejection of amended claim 6 and dependent claims 9, 13, 17, and 21, see page 9 and 10, based on '686 in view of '145, applicant's argument have been fully considered but they are not persuasive.

Applicant acknowledges that '145 teaches the susceptor angle range 0.1 –7.0°, but attack '145 does not teach substrate 300 mm (bottom of page 9) and does not recognize the problem of the instant application, which are taught by '686.

Pointing out the differences between the application and each individual reference is not sufficient to overcome a rejection based on a combination of the references. One cannot show non-obviousness by attacking references individually where the rejections are based on combinations of references. In re Keller, 208 USPQ 871 (CCPA 1981); In re Merck & Co., Inc., 231 USPQ 375 (Fed. Cir. 1986).

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 8-9, 12-13, 16-17, and 20-21 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 8 recites “the substrate supporting surface is inclined at an angle” is understood as defined in claim 6 (emphasize an). One interpretation of this claim includes that the side view of substrate supporting surface (#20a in Fig. 3 of the application) being a straight line (as oppose to a curve) and will be examined in this context henceforth.

“an angle which is made by the horizontal surface and ‘a tangent to the semiconductor substrate’ at a contact of ‘the substrate supporting surface and the semiconductor substrate’” is not clear. In a particular view, “a tangent” for a substrate with curved ends (W as shown in Fig. 4 of application) will have a tangent line the same as the line discussed in the last paragraph (#20a in Fig. 3 of the application). This is one of the interpretations of claims 8 and 9, and will be examined in this context henceforth.

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On the other hand, a substrate with flat ends or square edge (W as shown in Fig. 2A) will have no tangent line at the contact of the substrate supporting surface and this claim limitation is unclear because it appears to make patentability dependent on the use of the apparatus rather than the structural features of the apparatus.

The part "in an imaginary plane including a central axis of the pocket" is not clear as whether it refers to the angles, the contact point, the substrate supporting surface, or the substrate in such a plane. This part does not add any specific limitation to the claim and will be examined in this context henceforth.

Claim 9 recites the limitation "The susceptor of claim 7 ..." in line 1. As claim 7 is cancelled, there is insufficient antecedent basis for this limitation in the claim. Claim 9 will be examined as "The susceptor of claim 6 ...".

Claims 12, 13, 16, 17, 20, and 21 are rejected under 35 U.S.C. 112 as dependent claims of claims 8 or 9.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.

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2. Ascertaining the differences between the prior art and the claims at issue.
 3. Resolving the level of ordinary skill in the pertinent art.
 4. Considering objective evidence present in the application indicating obviousness or nonobviousness.
6. Claims 6, 8-10, 12-14, 16-18, and 20-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Moore (US 5820686, hereafter '686), in view of Somekh et al. (US 5643366, hereafter '366).

'686 teaches the limitations of:

Claim 6: A susceptor (Fig. 23D) in which a semiconductor substrate (#2304) is supported approximately horizontally in a pocket (center hole between #2304 and #2330 in Fig. 23D, not labeled in Fig. 23D, corresponding to #403, Figs. 4B-G,) when performing a vapor phase growth of a single crystal thin film on a front surface of the semiconductor substrate, and in which the pocket comprises an outer peripheral pocket portion (#2391a) to support the semiconductor substrate and a central side pocket portion (#2330) which is formed inside the outer peripheral side pocket portion to be concave from the outer peripheral side pocket portion (col. 24, lines 62-64, centrally formed hole is concave from #2391 including #2391a), wherein the outer peripheral side pocket portion comprises a substrate supporting surface which is inclined with respect to a horizontal surface to be lowered toward a central side from an outer peripheral side of the pocket (col. 24, lines 54-61), and a region of the substrate supporting surface excluding at least an inner peripheral edge supports a portion of a rear surface of the semiconductor substrate which is inside an outer peripheral edge of the semiconductor substrate (col. 24, lines 42-45 and 49-52, the support surface contacts the outer edge but not the inner surface of the wafer), wherein the pocket is for a silicon single crystal substrate of 300 mm in diameter (col. 8, lines 37-40).

Claims 8 and 9: The substrate supporting surface is inclined at an angle equal to an angle which is made by the horizontal surface and a tangent to the semiconductor substrate at a contact of the substrate supporting surface and the semiconductor substrate. (The substrate supporting surface, Fig. 23D, #2391a, is capable of holding a substrate with curved ends, the tangent line of which would form identical angle as the substrate supporting surface. "The material or article worked upon does not limit apparatus claims", MPEP 2115, this portion is to say no need to combined with a reference having curved ends).

Claims 10, 12, and 13: The central side pocket portion is concave to have a depth so as not to contact a rear surface of the semiconductor substrate (col. 24, lines 49-52).

Claims 14, 16-18, and 20-21: A vapor phase growth apparatus (col. 2, lines 7-11).

'686 shows an example of incline angle of about 4.1 degree for 200 mm substrate (col. 24, lines 57-61), '686 further teaches that the particular dimensions the substrate surround ring are determined empirically to minimize slip and maintain substantially uniform temperature in substrate #2304 (col. 25, line 13-17).

'686 does not explicitly teach the other limitation of claim 6:

The substrate supporting surface is inclined at an angle of more than 0 degree and not more than 1 degree with respect to the horizontal surface.

'686 does not explicitly teaches the use of substrate with curved ends, it does not explicitly meet the limitation of claims 8, 12, 16, 20, 9, 13, 17 and 21 (if a substrate with curved ends is needed). Because '686 teaches the use of substrate with straight angle at end (Fig. 23D) which makes the limitation indefinite, as discussed in the 112 rejection section.

'366 is an analogous art to holding of semiconductor substrates in chemical vapor deposition apparatus (CVD). '366 teaches a means to transfer wafer (Fig. 4) with a slope (#60) at a slight angle, preferably 1 to 3 degrees (col. 5, lines 57-67). '366 further teaches the use of substrates with curved ends (Fig. 4). The tangent line at the contact edge (#41 in Fig. 4) is defined by #58, #59 of the same figure. Therefore, "the angle defined by the substrate supporting surface with respect to the horizontal surface equal to an angle which is made by the horizontal surface and a tangent to the semiconductor substrate at a contact of the substrate supporting surface and the semiconductor substrate" is met.

At the time of the invention was made, it would have been obvious to a person of ordinary skill in the art to have empirically explored various angle of substrate supporting surface for 300 mm substrates and '366 discloses that one to three degrees for holding wafers is a preferred angle. The motivation would have been from empirically to minimize slip and maintain substantially uniform temperature in 300 mm substrates as taught by '686, with a reasonable expectation of success that one degree angle would have provided the low slip and maintain uniform temperature of substrate; and to have adopted a substrate with curved ends in the substrate processing environment provided in Fig. 23D of '686. The motivation would have been to achieve maximum wafer throughput while depositing uniform film layers (col. 1, lines 39-41); to support sufficient stability and rigidity to support either a single large wafer or multiple wafers (col. 3, lines 43-47); and to provide low slip and maintain uniform temperature as taught by '686

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(col. 25, lines 13-17); more specifically, the configuration given in Fig. 23D of '686 provides a uniform temperature of substrate (cols. 24, lines 53-54).

7. Claims 6, 8-10, 12-14, 16-18, and 20-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Moore (US 5820686, hereafter '686), Anderson et al. (US 2003/0178145, hereafter '145).

What '686 teaches and does not teach have already been discussed above.

'145 is an analogous art in semiconductor wafer substrate processing, including CVD. '145 teaches the substrate supporting surface can be 0.1-7 degrees ([0050, lines 4-7, ledge is substrate supporting surface). '145 is silent on the wafer size.

At the time of the invention was made, it would have been obvious to a person of ordinary skill in the art to have empirically explored various angle of substrate supporting surface for 300 mm substrates and '145 discloses that 0.1-7 degrees may be used. The motivation would have been from empirically to minimize slip and maintain substantially uniform temperature in substrate as taught by '686, with a reasonable expectation of success that one degree angle or below would have provided low slip and uniform temperature of substrate.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

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A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Keath T. Chen whose telephone number is 571-270-1870. The examiner can normally be reached on M-F, 8:30-5:00 EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Cleveland can be reached on 571-272-1418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

KC

K.C

Richard Bueker

Richard Bueker
Primary Examiner
Art Unit 1792